CLAIMS:

1. A method for monitoring a patient comprising:

employing hypothesis testing against each of a plurality of monitored signals to determine whether an artifact is present in the plurality of monitored signals, in which a null hypothesis includes an assumption that pairs of samples of highly correlated monitored signals of the plurality of monitored signals have a predetermined distribution; and

determining that an artifact may exist in one of the plurality of monitored signals when a likelihood that the null hypothesis is true falls below a predetermined confidence level.

2. The method according to claim 1, further comprising:

receiving a plurality of monitored signals from the patient, each of which provide information as to the health of the patient.

3. The method according to claim 1, wherein the predetermined distribution includes the same distribution as corresponding pairs of stored versions of the plurality of monitored signals.

4. The method according to claim 1, wherein the hypothesis testing includes generating a probability that each of the monitored signals includes an artifact.

5. The method according to claim 4, further comprising generating an output signal to alert an operator that at least one of the monitored signals includes an artifact when the generated probability exceeds a predetermined threshold.

6. A method for detecting an artifact in one or more samples ($s_1 \ldots s_n$) of a plurality of monitored signals ($S_1 \ldots S_n$) comprising:

calculating, for each (s_m) of the one or more samples ($s_1 \ldots s_n$) of the plurality of monitored signals ($S_1 \ldots S_n$), a cross probability (p_{mk}) of observing the sample (s_m) and another sample (s_k) assuming a null hypothesis is true, wherein the null hypothesis (H_0) is that the sample (s_m) and the other sample (s_k) have the same distribution as a stored version of the sample (s_m) of the plurality of monitored signals;

calculating a confidence (c_{mk}) level associated with each of the cross probabilities (p_{mk});

repeating the calculating steps for all combinations of pairs of highly correlated monitored signals of the plurality of monitored signals;

summing, for each sample (s_m), all of the cross probabilities (p_{mk}) associated with a pair of highly correlated signals (S_{mk}) that includes the sample (s_m); and

outputting a result for each sample (s_m) as a probability of not including an artifact in the sample, wherein if one or more of the probabilities of not including an artifact lies below a predetermined threshold indicating to a user that one or more samples associated with one or more of the probabilities may include an artifact.

7. The method according to claim 6, further comprising:
calculating a correlation matrix for the plurality of monitored signals ($S_1 \ldots S_n$) from a database of a plurality of stored monitored signals as follows:

$$\begin{bmatrix} r_{11} & \cdots & r_{1n} \\ \vdots & & \vdots \\ r_{n1} & \cdots & r_{nn} \end{bmatrix}$$

wherein r_{11} is an autocorrelation of a first monitored signal (S_1) of the plurality of monitored signals ($S_1 \ldots S_n$) with itself (r_{11}=1) and r_{1n} is a cross correlation between the first monitored signal (S_1) of the plurality of monitored signals ($S_1 \ldots S_n$) and another monitored signal (S_n) of the plurality of monitored signals ($S_1 \ldots S_n$).

8. The method according to claim 7, further comprising:
identifying one or more pairs of highly correlated monitored signals among the plurality of monitored signals by determining which one or more pairs of monitored signals have a cross correlation that exceeds a predetermined threshold.

9. The method according to claim 6, further comprising:
weighting each of the calculated cross probabilities so that samples being closer to a norm have a larger weight.

10. The method according to claim 9, further comprising determining a range of cross probabilities of the plurality of stored monitored signals for a given clinical condition, wherein the weighting includes:
weighting each of the calculated cross probabilities (p_{mk}) as follows:

$$P_{mk} = \frac{p_{mk} - (p_{mk\ \max\ specific\ clinical\ condition} + p_{mk\ \min\ specific\ clinical\ condition})/2}{(p_{mk\ \max\ specific\ clinical\ condition} - p_{mk\ \min\ specific\ clinical\ condition})} \times c_{mk}$$

wherein:

$p_{mk\ max\ specific\ clinical\ condition}$ represents a maximum probability value from a stored version of a pair of monitored signals, and

$p_{mk\ min\ specific\ clinical\ condition}$ represents a minimum probability value from a stored version of a pair of monitored signals.

11. A method for detecting an artifact in one or more samples ($s_1 \ldots s_n$) of a plurality of monitored signals ($S_1 \ldots S_n$) comprising:

calculating, for each (s_m) of the one or more samples ($s_1 \ldots s_n$) of the plurality of monitored signals ($S_1 \ldots S_n$), a cross probability (p_{mk}) of observing each sample (s_m) and another sample (s_k) assuming a null hypothesis is true, wherein the null hypothesis is that a combined distribution of the sample (s_m) and the other sample (s_k) have a predetermined distribution;

calculating a confidence (c_{mk}) level associated with each of the cross probabilities (p_{mk});

repeating the calculating steps for combinations of pairs of highly correlated monitored signals of the plurality of monitored signals;

summing, for each sample (s_m), a plurality of cross probabilities (p_{mk}) associated with a plurality of pairs of highly correlated signals (S_{mk}), each of which includes a sample (s_m);

outputting for each sample a result, wherein the result is obtained by subtracting the sum from one for each sample (s_m), as a probability of including an artifact in each sample; and

indicating to an operator of the monitoring system, if one or more of the probabilities of including an artifact exceeds a predetermined threshold, that one or more samples associated with the one or more probabilities above the predetermined threshold may include an artifact.

12. The method according to claim 11, further comprising continuously performing the calculating, summing and subtracting on a periodic basis as long as signals are being received from a patient.

13. An apparatus for monitoring a patient comprising:

a plurality of leads, each to receive a sample of a monitored signal;

a memory to store each of the received samples of the monitored signals; and

a processor coupled to the memory, said processor being programmed to:

employ hypothesis testing against each of a plurality of monitored signals to determine whether an artifact is present in the plurality of monitored signals, in which a null hypothesis includes an assumption that pairs of samples of highly

correlated monitored signals of the plurality of monitored signals have a predetermined distribution; and

determine that an artifact may exist in one of the plurality of monitored signals when a likelihood that the null hypothesis is true falls below a predetermined confidence level.

14. The apparatus according to claim 13, wherein the processor is further programmed to:

generate a probability that each of the monitored signals includes an artifact.

15. The apparatus according to claim 14, wherein the processor is further programmed to:

generate an output signal to alert an operator that at least one of the monitored signals includes an artifact when the generated probability exceeds a predetermined threshold.

16. An apparatus for detecting an artifact in one or more samples ($s_1 \ldots s_n$) of a plurality of monitored signals ($S_1 \ldots S_n$) comprising:

one or more leads coupled to receive one of the one or more samples ($s_1 \ldots s_n$) of the plurality of monitored signals ($S_1 \ldots S_n$);

a memory to store each of the received one or more samples of the plurality of monitored signals; and

a processor coupled to the memory and to the one or more leads (45) and being programmed for:

calculating, for each (s_m) of the one or more samples ($s_1 \ldots s_n$) of the plurality of monitored signals ($S_1 \ldots S_n$), a cross probability (p_{mk}) of observing each sample (s_m) and another sample (s_k) assuming a null hypothesis is true, wherein the null hypothesis (H_0) is that each sample (s_m) and another sample (s_k) have the same distribution as a stored version of the sample (s_m) of the plurality of monitored signals;

calculating a confidence level (c_{mk}) associated with each of the cross probabilities (p_{mk});

repeating the calculating steps for all combinations of pairs of highly correlated monitored signals of the plurality of monitored signals;

summing, for each sample (s_m), all of the cross probabilities (p_{mk}) associated with a pair of highly correlated signals (S_{mk}) that includes each sample (s_m); and

outputting a result for each sample (s_m) as a probability of not including an artifact in the sample, wherein if one or more of the probabilities of not including an artifact lies below a predetermined threshold indicating to a user that one or more samples associated with one or more of the probabilities may include an artifact.

17. The apparatus according to claim 16, wherein the processor is further programmed for:

calculating a correlation matrix for the plurality of monitored signals ($S_1 \ldots S_n$) from a database of a plurality of stored monitored signals as follows:

$$\begin{bmatrix} r_{11} & \cdots & r_{1n} \\ \vdots & & \vdots \\ r_{n1} & \cdots & r_{nn} \end{bmatrix}$$

wherein r_{11} is an autocorrelation of a first monitored signal (S_1) of the plurality of monitored signals ($S_1 \ldots S_n$) with itself ($r_{11}=1$) and r_{1n} is a cross correlation between the first monitored signal (S_1) of the plurality of monitored signals ($S_1 \ldots S_n$) and another monitored signal (S_n) of the plurality of monitored signals ($S_1 \ldots S_n$).

18. The apparatus according to claim 17, wherein the processor is further programmed for:

identifying one or more pairs of highly correlated monitored signals among the plurality of monitored signals by determining which one or more pairs of monitored signals have a cross correlation that exceeds a predetermined threshold.

19. The apparatus according to claim 16, wherein the processor is further programmed for:

weighting each of the calculated cross probabilities so that samples being closer to a norm have a larger weight, and the weighting includes:

weighting each of the calculated cross probabilities (p_{mk}) as follows:

$$P_{mk} = \frac{p_{mk} - (p_{mk\ \max\ specific\ clinical\ condition} + p_{mk\ \min\ specific\ clinical\ condition})/2}{(p_{mk\ \max\ specific\ clinical\ condition} - p_{mk\ \min\ specific\ clinical\ condition})} \times c_{mk}$$

wherein:

$p_{mk\ max\ specific\ clinical\ condition}$ represents a maximum probability value from a stored version of a pair of monitored signals, and

$p_{mk\ min\ specific\ clinical\ condition}$ represents a minimum probability value from a stored version of a pair of monitored signals.

20. A computer readable media having encoded thereon a plurality of instructions for causing a processor to:

employ hypothesis testing against each of a plurality of monitored signals to determine whether an artifact is present in the plurality of monitored signals, in which a null hypothesis includes an assumption that pairs of samples of highly correlated monitored signals of the plurality of monitored signals have a predetermined distribution; and

determine that an artifact may exist in one of the plurality of monitored signals when a likelihood that the null hypothesis is true falls below a predetermined confidence level.